-REMARKS-

The Examiner has indicated that claims 11, 14, 17 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claim. Claims 11, 14, and 17 have therefore been amended as such. No new subject matter has been added as a result of this amendment.

Claim 1 has been amended to more clearly define the invention with respect to the cited reference. The step of misaligning an element of the cavity has been changed to setting an element into a misaligned position. In addition, the subject matter of claims 4-7 has been included into claim 1. Claims 4 to 7 have been deleted. No new subject matter has been added as a result of this amendment.

The Examiner has rejected claims 1, 2, 3, 8, 9, 10, 12, 13, 15, and 16 as being anticipated by US patent no. 5,097,471 to Negus et al. The anticipation rejection is respectfully traversed for the reasons below.

Negus et al. describe a passively mode-locked laser that includes a resonant cavity having a gain medium therein. A transmissive element, which may be the gain medium, is also located in the cavity and is formed from a material which varies the two-dimensional, lateral spatial profile of the beam with respect to intensity due to the Kerr effect. The resonator is arranged such that the round trip gain of the system increases with respect to the intensity of the beam so that mode-locking operation can be achieved.

The Kerr effect is due to Kerr-Lens Mode Locking (KLM). KLM is a technique to produce mode locking of solid-state lasers (hence short pulse emission) based on the nonlinear reshaping of a laser beam following its propagation in a bulk nonlinear material. The nonlinear reshaping is due to a nonlinear lensing effect in the bulk material caused by self-focusing. The strength of nonlinear lensing is proportional to laser intensity. Hence the higher the laser intensity, the larger the nonlinear reshaping of the laser beam will be. The material used to produce nonlinear lensing can be the laser material itself, or another transparent material introduced in the laser cavity for that purpose. With a properly designed cavity, nonlinear lensing due to Kerr effect is such that it creates a differential gain favoring short pulse emission at the expense of

continuous-wave emission. However, even if the cavity parameters are set such that the KLM regime of emission should take place, there is no guarantee that the mode locking of the laser will be observed when the laser is turned on. The problem is that, in most cases, the KLM regime is not a self-starting regime of emission. To observe the KLM regime, one must perturb the laser cavity by various methods such as rapid changes to its alignment or length, among others. It should be noted that these perturbations to cavity parameters are only transient. The perturbations have an effect on the dynamics of solid-state lasers. They induce spiking of laser intensity, which facilitates the onset of the KLM regime.

At column 3, lines 4 to 6, Negus et al. indicate that a variation in the intensity of the circulating beam can be "induced by a fast perturbation of the alignment and/or length of the cavity which can be created by a sharp movement of a cavity mirror". It should be understood that this variation is transient and not permanent. The cavity mirror that is rapidly moved to induce spiking of laser intensity will quickly be returned to its original position. Furthermore, column 7, lines 33 to 38 state "It should be noted that the laser shown in FIG. 5 produces highly stable pulses that are relatively insensitive to variations in the length or alignment of the resonator. Thus, no complex and expensive active feedback techniques are necessary to stabilize the resonator". This is evidence that the system is only sensitive to the perturbation caused by the sharp movement of the element, and not to a permanent misalignment of the element.

Claim 1 has been amended to clearly define step (d) of the method as a step of "setting at least one of the elements making up the laser cavity into a misaligned position to achieve passive mode-locked operation of the semiconductor laser diode". The results obtained by the setup of the present invention clearly indicate that the nature of the laser emission (continuous-wave or mode-locked) is very sensitive to the precise setting of cavity parameters, such as mirror alignment. The setting of the element in a misaligned position requires a fine adjustment necessary to identify the misaligned position that will result in mode-locked operation. Because precision is involved, a sharp movement of the element would not lead to the desired result, namely passive mode-locked operation. Moreover, the element is <u>set</u> into a misaligned position, not temporarily misaligned in order to induce spiking of the laser intensity. There is a

clear distinction between the method described by Negus et al. and that claimed in claim 1 of the present application.

It is further argued that Negus et al. use Solid State (SS) Lasers, while the method of claim 1 states "using a semiconductor laser diode". SS lasers use a solid crystalline material as the lasing medium and are usually optically pumped. SS lasers should not be confused with semiconductor or diode lasers which are also 'solid state' but are almost always electrically pumped (though in principle, optical pumping may be possible with some). Semiconductor lasers have a very short inversion lifetime (under a nanosecond) while SS lasers used for KLM have a much longer inversion lifetime (microseconds and above). As a consequence, SS laser materials can be used to store laser energy. In responding to cavity perturbations, SS lasers tend to release the stored energy in the form of intense spikes, as sought by Negus et al., to induce the KLM regime. With their short inversion lifetimes, semiconductor laser materials cannot efficiently store laser energy. Hence, they cannot respond to cavity perturbations by the emission of intense spikes. This is further evidence that the claimed method differs from that described by Negus et al. Because the claimed method uses a semiconductor laser diode, the sharp movement of an element as described by Negus et al. would not result in passive mode-locked operation. Furthermore, the optical intensities in the transparent elements (lenses) of the semiconductor cavity are orders of magnitude too low to induce any significant Kerr lensing. Therefore, the KLM approach is not operative.

In view of the above arguments, it is believed that Negus et al. does not anticipate claims 1,2 ,3, 8, 9, 10, 12, 13, 15, and 16 of the present application.

Claims 4-7 are rejected under 35 U.S.C. 103 (a) as being unpatentable over Negus et al. in view of Anthon et al. (US Patent 4,933,947) and Mitsuhashi et al. (US Patent 4,405,236). Claims 4-7 have been deleted from the present application.

In view of the foregoing, reconsideration of the rejection of claims 1-3 and 8-17 is respectfully requested. It is believed that claims 1-3 and 8-17 are allowable over the prior art, and a Notice of Allowance is earnestly solicited.

The Commissioner for Patents 09/504,896

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